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Physical and mental health characteristics of adults with subjective cognitive decline: A study of 3,407 people aged 18-81 years from an MTurk-based U.S. national sample

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Physical and Mental Health Characteristics of 2,962 Adults With Subjective Cognitive Complaints

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Abstract

We investigated subjective cognitive complaints (SCCs), as well as physical and mental health factors, in adults and older adults. U.S. residents (N = 2,962) were recruited via the Amazon Mechanical Turk platform and completed a 90-item survey. Overall, 493/1930 (25.5%) of younger adults and 278/1032 (26.9%) of older adults endorsed SCCs. Analyses revealed worse physical and mental health characteristics in the SCC+ compared to the SCC- group, with primarily medium (Cohen's d = 0.50) to large (0.80) effect sizes. Age did not moderate relationships between SCCs and physical/mental health. Results suggest that SCCs are associated with a diverse set of negative health characteristics such as poor sleep and high body mass index, and lower levels of positive factors, including happiness and wisdom. Effect sizes of

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psychological correlates were at least as large as those of physical correlates, indicating that mental health is critical to consider when evaluating SCCs.

Keywords

Amazon's Mechanical Turk, online labor market, subjective health, cognition, psychological well-being, emotions, aging, mental health, physical health

Subjective cognitive complaints (SCCs) are common in older adults with and without objective cognitive deficits, with prevalence rates of approximately 27%–43% of people in their 60s and 70s (Reid & Maclullich, 2006). A growing literature examines the utility of SCCs as an indicator of underlying pathological age-associated cognitive decline years before the onset of the objective, measurable symptoms identifiable in mild cognitive impairment and dementia (Jessen et al., 2014). However, evidence for SCCs as a risk factor for future cognitive decline is still inconclusive (Jessen et al., 2020), and SCCs have clinical relevance outside of their predictive validity for later cognitive decline. That is, SCCs in the absence of objective cognitive symptoms are associated with worse physical health (Comijs et al., 2002), subjective and objective sleep disturbance (Lauriola et al., 2017; Miley-Akerstedt et al., 2018; Stenfors et al., 2013), and psychiatric symptom severity (Balash et al., 2013; Comijs et al., 2002; Slavin et al., 2010; Stenfors et al., 2013). Overall, it is important to investigate noncognitive correlates of SCCs in order to better elucidate the full clinical syndrome and appropriately direct physical and mental healthcare resources.

Although SCCs are typically investigated in older adults, they are reported with equal frequency across the adult lifespan (Begum et al., 2014; Derouesné et al., 1999; Ginó et al., 2010; Ponds & Van Boxtel, 2000; Ponds et al., 1997). In comparison to older adults, who more frequently attribute SCCs to intrinsic, age-associated cognitive decline, younger and middle-aged adults are more likely to ascribe SCCs to extrinsic, modifiable causes such as stress, multitasking, and concentration problems (Derouesné et al., 1999; Ponds et al., 1997; Vestergren & Nilsson, 2011). Studies that recruit both nonclinical younger and older adults find correlates of SCCs to be similar across the two age groups, underscoring the importance of stress, sleep disturbance, and psychiatric symptom severity in SCCs across the adult lifespan (Derouesné et al., 1999; Ponds & Van Boxtel, 2000; Ponds et al., 1997; Stenfors et al., 2013).

Most of the studies in the exiguous lifespan SCC literature have been conducted in geographically restricted areas (e.g., Paris suburb: Derouesné et al., 1999; Portugal: Ginó et al., 2010; Korea: Lee, Bangen, et al., 2020; Lee, Ju, et al., 2020), with no prior investigations in large, demographically diverse samples. Moreover, no adult lifespan studies to our knowledge have examined multiple physical health correlates of SCCs, and no studies have reported on associations with psychological constructs such as wisdom, resilience, and loneliness, which may shed light on potential risk and protective factors. As such, the purpose of the current study was to comprehensively characterize physical and mental health correlates of SCCs, including positive and negative

psychological traits/states, across the adult lifespan, in a large, demographically diverse sample. Participants were recruited using Amazon's Mechanical Turk (AMT), an online labor market allowing for the rapid acquisition of high quality data at low cost (Buhrmester et al., 2011; Hara et al., 2018; Litman et al., 2015; Mason & Suri, 2012; Sprouse, 2011). A prior study from our research group examined loneliness using the same AMT database (*Nguyen et al., 2020);* SCCs were not investigated in the previous paper. In the current study, we hypothesized that, compared to participants who did not endorse SCCs (SCC-), those who did endorse SCCs (SCC+) would report worse physical and mental health. Additionally, because of the well-known impact of aging on cognition, the moderating effect of age on the relationship between SCC status and mental/physical health was explored.

Methods

Participants

A sample of 3,407 people, aged 18–81, was recruited from AMT (Table 1). Participants completed a 90-item online survey during a 5-week period in the spring of 2019. The description of the survey, visible on AMT read, "We are looking for people to answer questions about a variety of topics, including age, gender, mood, wisdom, and sleep, among others." We presented the survey in general terms to reduce sampling bias and enhance generalizability. Interested participants consented to the study by selecting a hyperlink, which routed them to the questionnaire, presented via SurveyGizmo. Each participant received $1.00 for survey completion. Inclusion criteria were the following: (1) ≥18 years old, (2) English speaking, (3) residing in the United States, and (4) a Human Intelligence Task Approval rate >90% (Mason & Suri, 2012). Only AMT participants meeting these criteria were able to view the survey. Initially, 2,289 participants were recruited; however, the age distribution was skewed toward younger adults. Consequently, an additional 250 participants aged 35–45, 500 participants aged 45–55, and 368 participants aged 55+ were included to balance the sample with respect to age, leading to a preliminary sample size of 3,407.

Although AMT participants provide high quality data overall (Buhrmester et al., 2011; Coppock, 2019; Hauser & Schwarz, 2016; Horton et al., 2011; Litman et al., 2015; Mortensen & Hughes, 2018; Peer et al., 2014; Sprouse, 2011), a subset may be inattentive or may provide invalid data for other reasons. To address this issue, participants who provided impossible or highly improbable answers to survey items were excluded. Specifically, participants were excluded if they (1) completed the survey in <270 s (n = 104), (2) reported values for height and weight leading to a body mass index (BMI) <16 (n = 165), (3) reported fewer total close friends than the number of close friends seen at least once per month (n = 252), (4) reported their height at <3 feet (0.9 meters) or >7 feet (2.1 meters; n = 42), (5) reported living with ≥20 people in their household (n = 12), and/or (6) reported owning ≥40 pets (n = 3). Overall, 336 participants provided one invalid response, 86 participants provided two invalid responses,

Table 1. Demographic Characteristics, Physical Health, Mental Health, and Positive and Negative Psychological Traits/States by Group.

	SCCs (*N* = 771)	No SCCs (*N* = 2191)				
	Mean (SD)/Percentage	Mean (SD)/Percentage	*t* or χ^2	*p*	FDR-adjusted *p*	Cohen's *d* or Cramer's *V*
Demographic characteristics						
Age	43.16 (12.97); range = 18–73	43.44 (13.47); range = 18–81	0.50	.62	.64	0.02
Sex (% female)	482/769 (63%)	1186/2187 (54%)	18.93	<.001	<.001	.08
Years of education	n = 768	n = 2185	5.00	<.001	<.001	0.21
Less than a high school diploma	4 (<1%)	19 (<1%)				
High school degree or equivalent	392 (51%)	845 (39%)				
Bachelor's degree	272 (35%)	963 (44%)				
Master's or doctorate	100 (13%)	358 (16%)				
Race	n = 766	n = 2180	3.82	.43	.47	.04
American Indian/Alaska Native	10 (1%)	12 (<1%)				
Asian	40 (5%)	155 (7%)				
Multiracial	20 (3%)	63 (3%)				
Native Hawaiian or Pacific Islander	3 (<1%)	6 (<1%)				
Other	6 (<1%)	20 (<1%)				
White	621 (81%)	1768 (81%)				
Latinx origin (% endorsed)	79/762 (10.4%)	196/2175 (9.0%)	1.22	.27	.29	.02
Income (per year)	n = 762	n = 2165	3.20	.001	.001	0.14
<$35,000	397 (52%)	965 (44%)				
$35,000–$74,000	254 (33%)	834 (38%)				

(Continued)

Table 1. Continued

	SCCs (*N* = 771)	No SCCs (*N* = 2191)				
	Mean (SD)/Percentage	Mean (SD)/Percentage	*t* or χ^2	*p*	FDR-adjusted *p*	Cohen's *d* or Cramer's *V*
≥$75,000	111 (14%)	366 (17%)				
Married or a marriage-like relationship (% endorsed)	427/771 (55%)	1225/2191 (56%)	.064	.80	.80	.01
Employment status	n = 762	n = 2178	9.05	.03	.04	.03
Employed full time	462 (60%)	1394 (64%)				
Employed part-time	118 (15%)	332 (15%)				
Unemployed/unable to work	87 (11%)	172 (8%)				
Other	95 (12%)	280 (13%)				
Physical health						
BMI	28.33 (7.72)	27.15 (6.51)	3.83	<.001	<.001	0.30
Medications for medical conditions (% endorsed)	398/771 (52%)	712/2191 (32%)	89.02	<.001	<.001	.17
SF-12 Physical Health	44.41 (10.75)	49.32 (9.44)	11.26	<.001	<.001	0.49
PROMIS Sleep Disturbances	54.03 (8.66)	49.01 (8.92)	13.72	<.001	<.001	0.57
Sleep apnea item (% endorsed)	104/771 (13%)	158/2191 (7%)	27.88	<.001	<.001	.10
Mental health/Psychological traits/states						
SF-12 Mental Health	39.72 (11.83)	47.87 (11.15)	16.70	<.001	<.001	0.71
CDRS-2 total	4.95 (1.68)	5.76 (1.64)	11.70	<.001	<.001	0.49
PHQ-2 total	2.51 (1.84)	1.21 (1.55)	17.54	<.001	<.001	0.76
GAD-2 total	2.59 (1.88)	1.35 (1.64)	16.25	<.001	<.001	0.70

(Continued)

Table 1. Continued

	SCCs (N = 771)	No SCCs (N = 2191)				
	Mean (SD)/Percentage	Mean (SD)/Percentage	t or χ^2	p	FDR-adjusted p	Cohen's d or Cramer's V
UCLA Loneliness 4-item	9.76 (2.55)	8.39 (2.59)	12.64	<.001	<.001	0.53
CES-D Happiness Scale	6.47 (3.36)	8.71 (3.23)	16.31	<.001	<.001	0.68
SD-WISE total	3.54 (0.49)	3.78 (0.49)	11.34	<.001	<.001	0.49
Decisiveness	3.13 (0.90)	3.59 (0.87)	12.47	<.001	<.001	0.52
Emotional regulation	3.00 (0.82)	3.56 (0.82)	16.53	<.001	<.001	0.68
Pro-social behaviors	3.82 (0.65)	4.01 (0.64)	7.22	<.001	<.001	0.29
Social advising	3.57 (0.71)	3.68 (0.63)	4.26	<.001	<.001	0.16
Tolerance for divergent values	3.84 (0.67)	3.88 (0.63)	1.44	.15	.17	0.06
Social self-efficacy	12.85 (3.43)	13.86 (3.27)	7.28	<.001	<.001	0.30

Note. BMI = body mass index; CDRS = Connor Davidson Resilience Scale-2 item; CES-D = Center for Epidemiologic Studies-Depression scale; GAD-2 = Generalized Anxiety Disorder scale, 2-item; PHQ-2 = Patient Health Questionnaire, 2-item; PROMIS = Patient-Reported Outcomes Measurement Information System; SCC = subjective cognitive decline; SD-WISE = San Diego Wisdom Scale; UCLA = University of California Los Angeles.

22 participants provided three invalid responses, and one participant provided four invalid responses. Applying these exclusion criteria resulted in 445 (13.1%) participants being excluded, leaving a final sample of 2,962 participants for analysis.

This project, including a request for a waiver of documented consent, was reviewed through the University of California San Diego Human Research Protections Program by an IRB Chair and/or the IRB Chair's designee and certified as exempt from IRB review under 45 CFR 46.104(d), Category 2.

Materials

Within the 90-item survey, SCCs were measured with a single item ("Have you noticed a decline in your memory and thinking that is worrisome to you? [Yes/No]"). One goal of the research team was to minimize the survey length as much as possible. Consequently, empirically supported abbreviated versions of all measures were selected, with the exception of the San Diego Wisdom Scale (SD WISE), which does not have a short form. Multiple sociodemographic characteristics were measured including age, sex, education, race, annual income, marital status, and employment status. To assess physical health, the survey included two items measuring height and weight to calculate body mass index (BMI), one item asking whether or not any medications are taken for medical conditions, the 12-item Medical Outcomes Survey Short Form (assessing physical and mental health-related quality of well-being), the four-item Patient Reported Outcomes Measurement Information System (PROMIS) Sleep Disturbance short form (Cella et al., 2010), and the one-item PROMIS sleep apnea question (Cella et al., 2010). Depression was measured with the two-item Patient Health Questionnaire (PHQ 2; Kroenke et al., 2003) and anxiety was assessed with the two-item version Generalized Anxiety Disorder scale (Kroenke et al., 2007). Loneliness was measured with the four-item version of the UCLA Loneliness Scale (Russell et al., 1980), using the anchors from the third edition of the UCLA scale, *never, rarely, sometimes,* and *always*, rather than those of Russell et al. (1980), *never, rarely, sometimes*, and *often*. Measures of positive psychological factors included the 24-item SD WISE (Thomas et al., 2019), the two-item Connor Davidson Resilience Scale (Davidson, 2018), and the four-item Happiness Factor from the Center for Epidemiologic Studies Depression scale (Fowler & Christakis, 2008). The SD WISE includes the following subscales: decisiveness, emotional regulation, pro-social behaviors, social advising, and tolerance for divergent values. Social self-efficacy was assessed using four items, with minor wording modifications, from the Social Self Efficacy Scale (Muris, 2002; Zullig et al., 2011) that was originally developed for use with adolescents. These four items were selected for age appropriateness and included: (1) "How well can you become friends with other people?" (2) "How well can you have a chat with an unfamiliar person?" (3) "How well can you tell other people that they are doing something you don't like?" and (4) "How well can you succeed in preventing quarrels with other people?"

Statistical Analysis

Data were analyzed using SPSS 26.0. The distributional characteristics of all continuous variables were examined. For those that were highly skewed, appropriate nonparametric tests were used. Next, the hypothesis was tested with SCC group as the between subjects predictor ("independent") variable and physical and mental health scores as outcome ("dependent") variables. An omnibus multivariate analysis of variance (MANOVA) was conducted, followed by independent samples *t* tests for each continuous variable; due to low missing data rates (<1% for all variables), the classic MANOVA procedure was used rather than the generalized estimating equations procedure. For the two categorical outcome variables (presence or absence of medications and sleep apnea), χ^2 tests were conducted. With regard to the exploratory analysis, 2 group (SCC+ versus SCC-) × 2 age cohort (older: 50+ versus younger: 18–49) ANOVAs were conducted on the physical and mental health variables listed in Table 1 to examine the possible moderating effect of age. Age was dichotomized into two groups in order to contrast younger adults with older adults, given that the majority of the current SCC literature exists in aging populations. Although some researchers define older adults beginning in the 60s, this study focused on "young-old" adults because our sample of "old-old" adults, recruited via an internet-based data collection platform (AMT), was small. Additionally, age was also examined as a continuous variable in the moderation of the relationship between SCC group and physical and mental health. This supplemental analysis was undertaken in order to capitalize on the full extent of variability in age as a possible moderator (see Hayes, 2018).

Appropriate effect sizes are reported for all statistical tests, which include partial η^2 for the MANOVA, Cohen's *d* for *t* tests, and Cramer's *V* for χ^2 tests. The False Discovery Rate was used to control for Type I error, with α set at $p < .05$. The False Discovery Rate predicts and controls individual false positive results, while simultaneously maintaining a high level of statistical power relative to familywise error rate methods such as the Bonferroni correction (Benjamini & Hochberg, 1995). All statistical tests were two-tailed.

Results

Overall, 493/1930 (25.5%) of younger adults (ages 18 to 49) and 278/1032 (26.9%) of older adults (50 or older) endorsed the SCC item, $\chi^2(1) = .68$, $p = .41$. For continuous variables with nonnormal distributions, results from nonparametric tests (Mann Whitney Us) mirrored those from parametric statistics. For ease of interpretation, the parametric results are presented for all continuous variables. Of the demographic variables, sex, education, employment status, and annual income differed significantly across the two groups; however, when these variables were added to the models as covariates, results did not differ. For ease of interpretation, unadjusted parameters are presented.

With respect to the hypothesis that the SCC+ group would report worse physical and mental health compared to the SCC- group, the MANOVA was statistically significant, $F(11, 2937) = 46.47$, $p < .001$, $\lambda = 0.85$, $\eta_p^2 = .15$. In univariate analyses, all physical and mental health variables differed in the hypothesized direction, with the exception of SD WISE Tolerance for Diverging Values subscale. Specifically, compared to the SCC- group, the SCC+ group reported higher BMI, greater rate of taking medications for medical conditions, worse overall self-reported physical health, higher rates of self-reported sleep disturbance and sleep apnea, worse overall mental health, higher rates of depression, anxiety, and loneliness, and lower scores on scales for resilience, happiness, wisdom, and self-efficacy (Table 1). Moreover Cohen's *d* effect sizes were primarily in the medium (0.50) to large (0.80) range. When the sample was split by age (18–49 and 50+) for the exploratory analysis, interaction terms for the 2 SCC group × 2 age group ANOVAs were all nonsignificant. Similarly, when age was included as a continuous variable in the moderation analyses, the interaction terms were nonsignificant. These results suggest that age did not moderate the relationship between SCC and physical or mental health.

Discussion

Most research efforts to investigate SCCs have focused on understanding their relationship to objective cognitive decline (Kielb et al., 2017; Koppara et al., 2015) and their importance as an early risk factor for pathological cognitive decline in older adults (Jessen et al., 2020; Snitz et al., 2018). Although the literature on SCCs as a marker of early cognitive decline in older adults is growing rapidly, much less is known about SCCs as a general construct, especially their physical and mental health correlates in nonclinical populations across the adult lifespan. The present study evaluated self-reported physical and psychological correlates of SCCs in a large survey sample of adults aged 18–81. As hypothesized, both younger and older adults who endorsed SCCs exhibited worse self-reported physical health symptoms and psychological traits/states compared to those who did not endorse SCCs. Compared to the SCC- group, the SCC+ group had higher mean BMI, were more likely to take medications for medical conditions and were more likely to have sleep apnea or other sleep disturbances. They also reported worse physical well-being, worse mental well-being, higher depression and anxiety symptoms, greater loneliness, and lower levels of resilience, happiness, wisdom, and self-efficacy. Age did not moderate the relationship between SCCs and either physical or psychological functioning. Overall, the findings are consistent with previous literature suggesting that SCCs are associated with worse subjective and objective sleep disturbance (Lauriola et al., 2017; Miley-Akerstedt et al., 2018; Stenfors et al., 2013), and psychiatric symptom severity (Balash et al., 2013; Comijs et al., 2002; Slavin et al., 2010; Stenfors et al., 2013), and that SCC correlates are similar across the lifespan in both younger and older adults (Derouesné et al., 1999; Lee, Bangen, et al., 2020; Lee, Ju, et al., 2020; Ponds & Van Boxtel, 2000). To the authors' knowledge, this study is the first large scale investigation of

SCC rates to include a nonclinical sample of demographically diverse older and younger adults.

Symptoms of depression and anxiety showed the strongest relationships to SCCs, with moderate to large (Cohen's $d \geq 0.70$) effect sizes. This finding adds to earlier studies, which suggest that the association between SCCs and depression and anxiety is complex. Depression moderates the relationship between SCCs and objective cognitive impairment (Reid et al., 2012; Stenfors et al., 2013). Moreover, although depression and anxiety are closely related and highly comorbid, they are associated with different risk factors; pure anxiety tends to be associated with a wide range of stress-related factors, none of which are associated with pure depression (Beekman et al., 2000). One factor common to both is personal mastery, or perceived behavioral control, which may be a cognitive psychological marker of trait vulnerability for both depression and anxiety (Beekman et al., 2000). Depression interacts with personal mastery and general self-efficacy such that the association between depressive symptoms and SCCs may be stronger in participants with higher feelings of perceived mastery and social self-efficacy (Comijs et al., 2002). Data from the current study revealed that participants who endorsed SCCs exhibited lower levels of self-efficacy.

Current study results also showed strong associations between SCCs and negative/positive psychological factors, including loneliness, resilience, happiness, and wisdom (Cohen's $d \geq 0.30$). In each case, SCCs were related to higher levels of negative and lower levels of positive psychological factors, and effect sizes of psychological correlates were as large as (or larger) than those of physical correlates, suggesting that psychological features may be particularly relevant to the experience of cognitive problems in everyday life. These results highlight important associations that encourage future research. For example, future investigators could examine possible causal relationships between SCCs and negative/positive psychological factors in order to directly inform later interventions. That is, if initial subjective appraisals of one's own cognitive functioning lead to higher resilience/happiness and lower loneliness, then treatments to reduce SCCs could have positive downstream effects on resilience, happiness, and loneliness. Conversely, if positive/negative psychological variables are "upstream" factors that influence the development of later SCCs, then interventions to improve psychological functioning may reduce distressing SCCs. Importantly, these two possibilities are not mutually exclusive (i.e., bidirectional relationships are possible), and we leave it to future investigators to conduct longitudinal research that can begin to disentangle causal associations.

Wisdom is a complex, multidimensional psychological trait that is comprised of several specific components, including pro-social behaviors such as empathy and compassion, emotional regulation, self-reflection or insight, acceptance of divergent values, decisiveness, and social advising (Jeste & Lee, 2019; Meeks & Jeste, 2009; Thomas et al., 2019). Although it is often conflated with intelligence, wisdom encompasses cognitive, affective, and reflective dimensions (Ardelt & Jeste, 2018). Among the wisdom subscales of the SD WISE, the cognitive (decisiveness) and affective (emotional regulation) components of wisdom were the strongest correlates of SCCs.

The decisiveness component entails the cognitive abilities and dispositional qualities related to making decisions. The emotional regulation component pertains to the ability to maintain emotional homeostasis. Although the latter can be reflective of psychological distress, one of the items (e.g., *I cannot filter my negative emotions*) also involves an aspect impulse control related to frontal executive functions—specifically, response inhibition (Ardelt & Jeste, 2018). Thus, it is not surprising that individuals with SCCs would exhibit lower decisiveness and emotional regulation. At the same time, it is worth stressing that positive traits are potentially modifiable. There is growing literature on interventions designed to enhance levels of positive traits such as resilience and components of wisdom including emotional regulation (Lee, Bangen, et al., 2020; Lee, Ju, et al., 2020; Treichler et al., 2020).

Participants endorsing SCCs in the current study also reported greater loneliness than the comparison group. Loneliness has been previously identified as a major risk factor for adverse mental and physical health outcomes, including cognitive decline and dementia (Boss et al., 2015; Hawkley & Cacioppo, 2010; Tilvis et al., 2004; Wilson et al., 2007). A more detailed description of loneliness results within this AMT sample is presented in a companion paper (Nguyen et al., 2020).

With regard to physical functioning, SCCs had the strongest relationship with self-reported sleep disturbances and overall physical well-being, consistent with previous literature (Lee, Bangen, et al., 2020; Lee, Ju, et al., 2020). Disrupted sleep can contribute to both subjective and objective experiences of cognitive impairment (Alhola et al., 2007; Lauriola et al., 2017). In addition to general sleep disturbances, we also showed higher rates of obstructive sleep apnea (OSA) in the SCC+ group compared to the SCC- group. Although cognitive deficits have been well documented in patients with OSA, the relationship between SCCs and objective impairment in OSA remains unclear (Vaessen et al., 2015). Importantly, SCCs in combination with subjective sleep disturbances and OSA may represent early prodromal signs for developing mild cognitive impairment or dementia (Yaffe et al., 2011).

The present study has notable strengths. Analyses included nearly 3,000 adults across the adult lifespan, with sociodemographic diversity in terms of gender, race, and socioeconomic status. Utilization of the AMT online crowdsourcing marketplace allowed for access to thousands of research participants from demographically varied backgrounds from across the United States, without geographic restrictions (Buhrmester et al., 2011). Importantly, recruitment through internet samples may reduce biases from traditional samples (Gosling et al., 2004) and better approximate U.S. census data (Berinsky et al., 2012; Casler et al., 2013; Eriksson & Simpson, 2010; Johnson & Borden, 2012). Moreover, the precaution of describing the survey in general terms likely decreased sampling bias and enhanced generalizability. Although the unsupervised nature of data collection potentially reduces reliability and validity, a large number of studies have shown that AMT data quality is equivalent to that acquired in controlled settings (Buhrmester et al., 2011; Johnson & Borden, 2012; Litman et al., 2015; Mason & Suri, 2012; Peer et al., 2014; Sprouse, 2011) and participants who provided impossible or highly implausible responses to

survey items were excluded to ensure validity of results. Furthermore, this study included a comprehensive assessment of physical and mental health factors, including positive and negative psychological traits/states, which, to the authors' knowledge, have never been simultaneously investigated in the context of SCCs. Overall, these findings provide a more comprehensive understanding of the physical and psychological characteristics associated with SCC, above and beyond strict neuropsychiatric diagnoses.

Nevertheless, this investigation was limited in several respects. First, the presence of SCCs was determined using a single yes/no question rather than a more detailed method of inquiry or standardized measure; this prevented the assessment of SCC severity and our ability to capture complaints in specific cognitive domains (e.g., attention, memory, executive functions). Many self-report measures have been used to investigate SCCs (Rabin et al., 2015), but there is no established gold standard method of assessment (Molinuevo et al., 2017). Moreover, the single item mode of assessment is more pragmatic and consistent with typical clinical practice, meaning that results from the current study may generalize to some clinical settings where SCCs are measured as part of patient care. Second, due to restrictions of the AMT platform, all data are self-report, which has well-known limitations due to recall and response bias (Janssens & Kraft, 2012; Stone et al., 1999). Although the assessment of SCCs requires self-report by definition, this represents a limitation with regard to reports of physical health and functioning. Relatedly, performance-based cognitive tests to determine objective cognitive impairment were not administered. Therefore, the presence of cognitive disorders cannot be ruled out in a subset of this sample, and the Jessen et al. (2014) exclusion criterion of mild cognitive impairment and dementia cannot be assessed. Third, although the sample was diverse across multiple demographic characteristics, representation in terms of racial minority groups and people of low socioeconomic status was lower than anticipated. Relatedly, a group of participants recruited through AMT cannot generalize perfectly to the larger U.S. population, given that some level of technological familiarity and comfort is required to use the platform. Consequently, the external validity of this study was limited in that regard. Finally, the cross-sectional design limits the ability to draw causal inferences regarding SCCs and their correlates, and future prospective longitudinal studies are needed to clarify these relationships.

Conclusions

Notwithstanding these limitations, the current study contributes to important research aimed at a better understanding the noncognitive aspects of SCCs. These findings help characterize the wide range of physical and psychological correlates of SCCs. Notably, the effect sizes of psychological correlates of SCC were as large as (or larger) than those of physical correlates, indicating that mental health and psychological features are critical to consider when evaluating SCCs in adults of all ages.

Author Note

DVJ and EWT are Joint Senior Authors.

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Declaration of Conflicting Interests

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